IEEE Guide for Installation, Maintenance, and Operation of Irrigation Equipment Located Near or Under Power Lines

IEEE Power Engineering Society

Sponsored by the
Transmission and Distribution Committee

1542™

IEEE
3 Park Avenue
New York, NY 10016-5997, USA

12 February 2008

IEEE Std 1542™-2007

IEEE Guide for Installation, Maintenance, and Operation of Irrigation Equipment Located Near or Under Power Lines

Sponsor

Transmission and Distribution Committee
of the
IEEE Power Engineering Society

Approved 27 September 2007

IEEE-SA Standards Board

Abstract: The guide is based on industry practices, and guidelines for installation, maintenance and operation of irrigation equipment near or under power lines as they pertain to minimum distance to energized conductors and proper grounding to minimize nuisance shocks are presented. A variety of conditions in general terms is covered in this guide. Specific recommendations are made for the type of irrigation systems and power line parameters most commonly found.

Keywords: farm irrigation systems, irrigation, irrigation systems, sprinklers

The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA

PDF: ISBN 978-0-7381-5699-6 STD95729
Print: ISBN 978-0-7381-5700-9 STDPD95729

IEEE Standards documents are developed within the IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (IEEE-SA) Standards Board. The IEEE develops its standards through a consensus development process, approved by the American National Standards Institute, which brings together volunteers representing varied viewpoints and interests to achieve the final product. Volunteers are not necessarily members of the Institute and serve without compensation. While the IEEE administers the process and establishes rules to promote fairness in the consensus development process, the IEEE does not independently evaluate, test, or verify the accuracy of any of the information or the soundness of any judgments contained in its standards.

Use of an IEEE Standard is wholly voluntary. The IEEE disclaims liability for any personal injury, property or other damage, of any nature whatsoever, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication, use of, or reliance upon this, or any other IEEE Standard document.

The IEEE does not warrant or represent the accuracy or content of the material contained herein, and expressly disclaims any express or implied warranty, including any implied warranty of merchantability or fitness for a specific purpose, or that the use of the material contained herein is free from patent infringement. IEEE Standards documents are supplied "**AS IS**."

The existence of an IEEE Standard does not imply that there are no other ways to produce, test, measure, purchase, market, or provide other goods and services related to the scope of the IEEE Standard. Furthermore, the viewpoint expressed at the time a standard is approved and issued is subject to change brought about through developments in the state of the art and comments received from users of the standard. Every IEEE Standard is subjected to review at least every five years for revision or reaffirmation. When a document is more than five years old and has not been reaffirmed, it is reasonable to conclude that its contents, although still of some value, do not wholly reflect the present state of the art. Users are cautioned to check to determine that they have the latest edition of any IEEE Standard.

In publishing and making this document available, the IEEE is not suggesting or rendering professional or other services for, or on behalf of, any person or entity. Nor is the IEEE undertaking to perform any duty owed by any other person or entity to another. Any person utilizing this, and any other IEEE Standards document, should rely upon his or her independent judgment in the exercise of reasonable care in any given circumstances or, as appropriate, seek the advice of a competent professional in determining the appropriateness of a given IEEE standard.

Interpretations: Occasionally questions may arise regarding the meaning of portions of standards as they relate to specific applications. When the need for interpretations is brought to the attention of IEEE, the Institute will initiate action to prepare appropriate responses. Since IEEE Standards represent a consensus of concerned interests, it is important to ensure that any interpretation has also received the concurrence of a balance of interests. For this reason, IEEE and the members of its societies and Standards Coordinating Committees are not able to provide an instant response to interpretation requests except in those cases where the matter has previously received formal consideration. A statement, written or oral, that is not processed in accordance with the IEEE-SA Standards Board Operations Manual shall not be considered the official position of IEEE or any of its committees and shall not be considered to be, nor be relied upon as, a formal interpretation of the IEEE. At lectures, symposia, seminars, or educational courses, an individual presenting information on IEEE standards shall make it clear that his or her views should be considered the personal views of that individual rather than the formal position, explanation, or interpretation of the IEEE.

Comments for revision of IEEE Standards are welcome from any interested party, regardless of membership affiliation with IEEE. Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments. Comments on standards and requests for interpretations should be submitted to the following address:

Secretary, IEEE-SA Standards Board
445 Hoes Lane
Piscataway, NJ 08854
USA

Introduction

This introduction is not part of IEEE Std 1542-2007, IEEE Guide for Installation, Maintenance, and Operation of Irrigation Equipment Located Near or Under Power Lines.

The guide is intended for designers, installers, and operators of the irrigation equipment, as well as electric power utilities whose lines are located near or above the irrigation systems. General information is provided on installation, maintenance, and operation of irrigation equipment as it relates to safety due to the presence of electric power lines. The following parameters are considered:

a) Distance to energized conductors during installation

b) Proper grounding to minimize nuisance shocks

c) Distance between irrigation nozzle and power line conductors during operation of the irrigation system

The recommended minimum conductor-to-nozzle distance is based on the maximum allowable body leakage current of 5 mA rms and field tests conducted by the Nebraska Public Power District and the USDA Agricultural Research Service, University of Nebraska.

Because of the great variety of conditions, practices, electrical system designs, types of irrigation systems, water conductivity, and ground resistance values, this guide covers these variables only in general terms. However, specific recommendations are made for the type of irrigation system and power line parameters that are most representative in the industry. The IEEE makes no representation or warranty as to the adequacy or accuracy of the information in this guide or as to economy, or safety issues associated with the use of this guide. When determining whether or not, and/or how, to use the information in this guide, all factors shall be considered with regard to the specific situation(s).

This material is intended to provide a helpful reference for those seeking information on common industry practices so they may consider the experience of others in developing or modifying their own practices.

Notice to users

Laws and regulations

Users of these documents should consult all applicable laws and regulations. Compliance with the provisions of this standard does not imply compliance to any applicable regulatory requirements. Implementers of the standard are responsible for observing or referring to the applicable regulatory requirements. IEEE does not, by the publication of its standards, intend to urge action that is not in compliance with applicable laws, and these documents may not be construed as doing so.

Copyrights

Updating of IEEE documents

Users of IEEE standards should be aware that these documents may be superseded at any time by the issuance of new editions or may be amended from time to time through the issuance of amendments, corrigenda, or errata. An official IEEE document at any point in time consists of the current edition of the document together with any amendments, corrigenda, or errata then in effect. In order to determine whether a given document is the current edition and whether it has been amended through the issuance of amendments, corrigenda, or errata, visit the IEEE Standards Association website at http://ieeexplore.ieee.org/xpl/standards.jsp, or contact the IEEE at the address listed previously.

For more information about the IEEE Standards Association or the IEEE standards development process, visit the IEEE-SA website at http://standards.ieee.org.

Errata

Errata, if any, for this and all other standards can be accessed at the following URL: http://standards.ieee.org/reading/ieee/updates/errata/index.html. Users are encouraged to check this URL for errata periodically.

Interpretations

Current interpretations can be accessed at the following URL: http://standards.ieee.org/reading/ieee/interp/index.html.

Patents

Attention is called to the possibility that implementation of this guide may require use of subject matter covered by patent rights. By publication of this guide, no position is taken with respect to the existence or validity of any patent rights in connection therewith. The IEEE is not responsible for identifying Essential Patent Claims for which a license may be required, for conducting inquiries into the legal validity or scope of Patents Claims or determining whether any licensing terms or conditions provided in connection with submission of a Letter of Assurance, if any, or in any licensing agreements are reasonable or non-discriminatory. Users of this guide are expressly advised that determination of the validity of any patent rights, and the risk of infringement of such rights, is entirely their own responsibility. Further information may be obtained from the IEEE Standards Association.

Participants

At the time this guide was submitted to the IEEE-SA Standards Board for approval, the Corona and Field Effects Working Group had the following membership:

David Phillips, *Chair*

George Gela	Nestor Kolcio	D. L. Schroeder
Don Gilles	Ted Loudou	LaVerne Stetson
Gary Johnson	Robert Rusch	Jim Stewart

The following members of the individual balloting committee voted on this guide. Balloters may have voted for approval, disapproval, or abstention.

Steven C. Alexanderson
Ali Al Awazi
Harvey L. Bowles
Chris Brooks
Thomas J. Buonincontri
Keith Chow
Robert A. Christman
Patrick I. Clark
Michael D. Clodfelder
Tommy P. Cooper
Russ C. Dantzler
Matthew T. Davis
F. A. Denbrock
J. F. Doering
Paul R. Drum
Gary Engmann
C. C. Erven
Dan Evans
George Gela
Randall C. Groves
Richard W. Hensel
David A. Horvath
Dennis Horwitz
Gael Kennedy
Robert O. Kluge
J. L. Koepfinger
Jim Kulchisky
Scott R. Lacy
Chung-Yiu Lam
Lawrence D. Long
G. Luri
Keith N. Malmedal
Francisco J. Melendez
Gary L. Michel
Abdul M. Mousa
Michael S. Newman
Carl I. Orde
Lorraine K. Padden
Neal K. Parker
David Phillips
Percy E. Pool
Charles W. Rogers
Bartien Sayogo
A. John Vandermaar
Daniel J. Ward
James W. Wilson
Luis E. Zambrano
James A. Ziebarth
Ahmed F. Zobaa

When the IEEE-SA Standards Board approved this guide 27 September 2007, it had the following membership:

Steve M. Mills, *Chair*
Robert M. Grow, *Vice Chair*
Don Wright, *Past Chair*
Judith Gorman, *Secretary*

Richard DeBlasio
Alex Gelman
William R. Goldbach
Arnold M. Greenspan
Joanna N. Guenin
Kenneth S. Hanus
William B. Hopf
Richard H. Hulett
Hermann Koch
Joseph L. Koepfinger*
John Kulick
David J. Law
Glenn Parsons
Ronald C. Petersen
Tom A. Prevost
Narayanan Ramachandran
Greg Ratta
Robby Robson
Anne-Marie Sahazizian
Virginia C. Sulzberger
Malcolm V. Thaden
Richard L. Townsend
Howard L. Wolfman

*Member Emeritus

Also included are the following nonvoting IEEE-SA Standards Board liaisons:

Satish K. Aggarwal, *NRC Representative*
Michael H. Kelley, *NIST Representative*

Lorraine Patsco
IEEE Standards Program Manager, Document Development

Matthew J. Ceglia
IEEE Standards Program Manager, Technical Program Development

Contents

IEEE Guide for Installation, Maintenance, and Operation of Irrigation Equipment Located Near or Under Power Lines

1. Overview

1.1 Scope

The guide is based on industry practices and presents guidelines for installation, maintenance, and operation of irrigation equipment near or under power lines as they pertain to minimum distance to energized conductors and proper grounding to minimize nuisance shocks. The guide covers a variety of conditions in general terms. Specific recommendations are made for the type of irrigation systems and power line parameters most commonly found.

1.2 Purpose

The guide is intended for designers, installers, and operators of the irrigation equipment, as well as electric power utilities whose lines are located near or above the irrigation systems. General information is provided on installation, maintenance, and operation of irrigation equipment as it relates to safety due to the presence of electric power lines. The following parameters are considered:

a) Distance to energized conductors during installation

b) Proper grounding to minimize nuisance shocks

c) Distance between irrigation nozzle and power line conductors during operation of the irrigation system

The recommended minimum conductor-to-nozzle distance is based on the maximum allowable body leakage current of 5 mA rms and field tests conducted by the Nebraska Public Power District and the USDA Agricultural Research Service, University of Nebraska.

Because of the great variety of conditions, practices, electrical system designs, types of irrigation systems, water conductivity, and ground resistance values, this guide covers these variables only in general terms. However, specific recommendations are made for the type of irrigation system and power line parameters that are most representative in the industry. The IEEE makes no representation or warranty as to the adequacy or accuracy of the information in this guide or as to economy, or safety issues associated with the